

REMARKS

This amendment is a submission under 37 CFR 1.114, Request for Continued Examination.

All of the pending claims were rejected under various combinations of prior art asserted by the Examiner. Claims 1, 3 and 4 were rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Fissel et al. "Low Temperature Growth of SiC Thin Films on Si and 6H-SiC by Solid Source Molecular Beam Epitaxy" (hereinafter Fissel), in view of the English language translation of the abstract of Japanese Patent Publication 62-091492 to Tashio (hereinafter Tashiro), in view of U.S. Patent 5,861,346 to Hamza et al. (hereinafter Hamza), and U.S. Patent 3,385,723 to Pickar (hereinafter Pickar). Claim 2 was rejected by the Examiner under 35 U.S.C 103(a) as being unpatentable over Fissel in view of Tashiro, Hamza and Pickar and further in view of Kaneda et al. "MBE Growth of 3C SiC/6H SiC and the Electric Properties of Its P-N Junction" (hereinafter Kaneda). Claim 5 was rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Fissel in view of Tashiro, Hamza, Pickar and further in view of U.S. Patent 5,915,194 to Powell (hereinafter Powell) or U.S. Patent 3,675,619 to Burd (hereinafter Burd). Claim 6 was rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Fissel in view of Tashiro, Hamza, Pickar and further in view of U.S. Patent 5,354,384 to Sneed et al. (hereinafter Sneed) and Burd.

The Examiner's remarks and the references cited therein were carefully reviewed by applicants. In response, applicants have filed this Request for Continued Examination. Applicants herein amend claims 1 and 6. The limitations of claims 2-5 were added by this amendment to claim 1.

Concerning claim 1, the Examiner fails to state a *prima facie* ground of rejection for this claim because the combination asserted by the Examiner fails to anticipate applicants invention as a whole, namely a solid source method of growing a homoepitaxial SiC film

within an MBE system having a growth chamber and effusion cells having shutters, comprising the steps of charging a first crucible with a quantity of Fullerenes; installing said first crucible into a first effusion cell; placing said first effusion cell into the growth chamber; coating a second crucible with a layer of SiC; charging said second crucible with a quantity of solid Si; installing said second crucible into a second effusion cell; placing said second effusion cell into the growth chamber; providing a 6H-SiC substrate; preparing said substrate; loading said substrate into the growth chamber; evacuating the growth chamber; heating said substrate; heating said first effusion cell to a temperature range of about 500° C to 650° C; heating said second effusion cell to a temperature above about 1500° C; and, growing a 6H-SiC homoepitaxial layer upon said substrate by controllably actuating the effusion cell shutters. Applicants have successfully demonstrated for the first time a method of growing a homoepitaxial 6H-SiC layer upon a 6H-SiC substrate using solid source MBE. This is reflected in the patent specification and claims and represents a breakthrough in the state of the art.

None of the prior art cited by the Examiner suggests or anticipates applicants' invention. The references cited by the Examiner represent non-analogous methods and techniques, and an attempt to combine them would fail because such attempt would meld deposition techniques considered disparate by those having ordinary skill in the art. In other words, the references cited by the Examiner are simply not amenable to combination and no artisan looking to solve the problem of producing high quality homoepitaxial SiC would do so.

In order to make this rejection, the Examiner picks and chooses among isolated prior art references to arrive at the asserted combination using nothing else but applicants' own teachings as a template. Such a hindsight analysis is contrary to long established Patent Office and legal precedent, **In re Fritch**, 23 USPQ 2d 1780, 1784 (Fed. Cir. 1992)

"It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered

*obvious. This court has previously stated that “[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.” (quoting **In re Fine**, 837 F.2d 1071, 1075, 5 USPQ 2d 1596, 1600 (Fed. Cir. 1988)).”*

The law is well settled that there must be some teaching or suggestion in the prior art references themselves to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine the prior art references to arrive at the claimed invention. The combination of elements from non-analogous sources, in a manner that reconstructs the applicant's invention only with the benefit of hindsight, is insufficient to present a *prima facie* case of obviousness. *“There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself.”* **In re Oetiker**, 977 F.2d 1443, 24 USPQ 2d 1443, 1446 (Fed. Cir. 1992) (emphasis added) See also **In re Fritch** 972 F.2d. 1260, 23 USPQ 2d 1780, 1783-84 (Fed Cir. 1992) *“The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.”*

Fissel teaches and describes an electron beam gun evaporation technique. Such a technique gives less than desirable results because the flux generated by the electron beam is unstable and results in inconsistent material growth and is not a solution to the problem of providing high quality SiC semiconductor material, especially not homoepitaxial 6H-SiC. This express shortcoming of Fissel is noted in applicants' patent application in the last paragraph of page two. Applicants' invention overcomes this problem.

Tashiro generally describes an MBE technique. Beyond this generalized description, Tashiro is inapposite to applicants' invention.

Hamza's method uses C₆₀ to grow mixed polytype SiC forms, not homoepitaxial, single crystalline films as does applicants' method. Hamza is inapplicable as a solution to

the problem solved by applicants' invention. This growing of a homoepitaxial layer is recited by applicants as a claim limitation, overlooked by the Examiner.

Concerning Pickar, as applicants stated in their patent specification, a significant hurdle that must be overcome in order to use solid Si in solid source MBE is the fact that molten silicon will react with and dissolve whatever container it is in. Applicants' novel solution to this problem is to first coat the crucible with a coating of SiC prior to being charged with solid Si. This is clearly recited in the fourth claim element "coating a second crucible with a layer of SiC". Pickar teaches using sucrose and Si powder as reactants to form a coating. Applicants coat the crucible with a layer of SiC using SiC, not sucrose and Si powder. This claim limitation is positively recited in the claims and is improperly overlooked by the Examiner. Pickar's chemistry and physics are entirely different.

Kaneda states in his article that his method is used to form a 3C SiC film on 6H-SiC. Kaneda teaches electron beam heating. This is an entirely different method of MBE than the thermal evaporation method described and claimed by applicants. Accordingly, the teachings and methodology are non-analogous. Further, at Kaneda's Figs. 5f and 6c, the RHEED patterns clearly show that polycrystalline, non-homogeneous films are formed at applicants substrate temperature, proof that Kaneda's technique is chemically and physically a fundamentally different process. Kaneda's method cannot be used to form homoepitaxial SiC films, in plain contradistinction to applicants' invention. Therefore, contrary to the Examiner's assertions, Kaneda teaches away from applicants' substrate temperature, as recited in applicants' claims.

Powell is directed to CVD growth techniques, again not analogous to applicants' invention. Powell teaches etching an H/HCL mixture within the CVD chamber with the sample temperature at 1000°C. This step is impossible to duplicate in an MBE chamber.

The Burd apparatus is not on point. While Burd mentions polishing substrates, there is nothing else in this reference to render it applicable to applicants' invention. Absent a

hindsight analysis using applicants' invention as a guide, there is no reason or motivation to combine this reference with the others in the manner suggested by the Examiner.

Sneed recites a cleaning method utilizing carbon dioxide sprays. Absent applicants' own teachings, it is unclear why the Examiner considers Sneed applicable.

Concerning the Examiner's rejection of claim 6, the combination of Fissel, Tashiro, Hamza and Pickar, Sneed and Burd fails to applicants invention as a whole, namely a solid source method of growing a homoepitaxial SiC film within an MBE system having a growth chamber and effusion cells having shutters, comprising the steps of: charging a first crucible with a quantity of Fullerenes; installing said first crucible into a first effusion cell; placing said first effusion cell into the growth chamber; coating a second crucible with a layer of SiC; exposing said coated crucible to atmosphere; repeating said coating step above; charging said second crucible with a quantity of solid Si; installing said second crucible into a second effusion cell; placing said second effusion cell into the growth chamber; providing a SiC substrate; polishing said substrate; cleaning said substrate with pressurized CO₂; etching said substrate; rinsing said substrate; drying said substrate with pressurized N₂; loading said substrate into the growth chamber; evacuating the growth chamber; heating said substrate to a temperature of about 1500° C; heating said first effusion cell to a temperature range of about 500° to 650° C; heating said second effusion cell to a temperature above about 1500° C; and, growing a homoepitaxial layer of SiC upon said substrate by controllably actuating the effusion cell shutters.

The Examiner's proposed combination Fissel, Tashiro, Hamza, Pickar, Sneed and Burd can be only arrived at by following the teachings of applicants own invention, using applicants' claims as a template. There is simply no basis for the artisan to even consider the teachings of Fissel, Tashiro, Hamza and Pickar to be sufficiently related to result in their teachings to be collectively considered. The Examiner has done no more than point to and combine specific, disparate elements found in the prior art without reciting any motivation for their combination. *"The mere fact that the prior art may be combined in the manner suggested*

by the Examiner does not make the combination obvious unless the prior art suggested the desirability of the modification" In Re Fritch, 972 F. 2d 1260, 1266, 23 U.S.P.Q. 2d 1780, 1783-84 (Fed. Cir. 1992). Here, the only motivation to pick and choose among elements from the prior art is based on the teachings of applicants' invention itself. Such hindsight analysis is entirely improper. Lastly, even if the combination suggested by the Examiner were somehow made, the combination would fail to teach, suggest or anticipate applicants' invention. The varied and disparate prior art references cannot be combined in any reasonable manner to result in the solid source MBE method of growing homoepitaxial SiC as described and claimed by applicants. In short, the references are simply too disparate to be combined for the purpose suggested by the Examiner and even if somehow combined, fail to anticipate applicants' invention. As such, the Examiner has failed to state a *prima facie* case.

Furthermore, the Examiner's statements concerning obviousness are conclusory and do not adequately address the issue of motivation to combine. This factual question of motivation is material to patentability, and cannot be resolved on subjective belief and unknown authority. To establish obviousness, the Examiner must do more than identify the elements in the prior art. There must also be "*some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead the individual to combine the relevant teachings of the references.*" See *In Re Fine*, 837 F. 2d. 1071, 1074, 5 U.S.P.Q. 2d. 1596, 1598 (Fed. Cir. 1988). Here, the Examiner has failed to provide a factual basis to support the legal conclusion of obviousness. The Examiner is expected to make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (U.S. 1966) and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must extend from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. If a combination of two items of prior art is asserted to establish obviousness, the party asserting invalidity "*bears the burden of showing some teaching or suggestion in these references which supported their use in combination.*"

Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 U.S.P.Q. 657, 664 (Fed. Cir. 1985). There is no basis for the artisan to even consider the teachings of Fissel, Tashiro, Hamza, Pickar, Powell, Burd and Sneed to be sufficiently related to result in their teachings being collectively considered in this case. Instead, the Examiner picks and chooses among elements of the prior art using applicants' claimed invention as a guide. This the Examiner cannot do. **In Re Fritch**, 972 F. 2d 1260, 1266, 23 U.S.P.Q. 2d 1780, 1783-84 (Fed. Cir. 1992).

Additionally and as described above, the Examiner has failed to consider all of the applicants claim limitations. In effect, the Examiner has failed to consider the subject matter of the invention as a whole contrary to the plain language of 35 U.S.C. 103(a) "*the subject matter as a whole would have been obvious at the time the invention was made*". (emphasis added)

Representative of many decisions on this topic are: **In re Angstadt**, 190 USPQ 214, 217 (C.C.P.A. 1976) "*We note at the outset that the claim limitation . . . must be given effect since we must give effect to all claim limitations.*" See also: **In re Bisley**, 94 USPQ 80, 83 (C.C.P.A. 1952) "*It appears to us that these claims define the angle of the pivot pin with respect to component elements of the mixer, albeit by geometrical language, in such a manner that the pin is structurally located, by the terms of these claims, at a substantial angle with respect to identified horizontal and vertical datum planes and within that range of angularity which will achieve appellant's desired novel result. Definite limitations in a claim should not be ignored or construed out of the claim.* (citation omitted) Therefore, we think that claims 20 and 39 patentably define over Kochner et al. and that the board erred in rejecting these claims on that reference." (emphasis added)

In view of the foregoing, the Examiner has failed to establish a *prima facie* showing of obviousness in applicants' invention. The Examiner has impermissibly relied on applicants own claimed invention as a guide in making the rejection. Claims 1 and 6, as

amended, clearly patentably distinguish over all of the prior art cited by the Examiner and the Examiner is requested to allow the claims as amended.

The reference cited without reliance in the Examiner's Action has been considered and deemed not to preclude allowance of the application.

Respectfully submitted,

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